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Chapter 10
Cross-cutting Perspective on Agriculture

Gül Özerol and Jenny Troeltzsch

10.1 Introduction

Agriculture is among the major water user sectors in the North-west Europe region. While the use of water for energy production, mainly for cooling of power plants, has a higher share in most of the countries in the region, agricultural water use maintains an average of 24 % share within the total water use in Europe (EEA: European Environment Agency 2009). At the same time, agriculture is a vulnerable sector in terms of the impacts of drought on both global and European agricultural production (Geng et al. 2015). Although making a universal definition of drought is not straightforward due to its diverse drivers and impacts, the following definition can be made for agricultural drought: "the result of a shortage of precipitation over a particular timescale that leads to a soil moisture deficit that limits water availability for crops to such an extent that yields are reduced" (Sepulcre-Canto et al. 2012: 3519). A key relationship that is addressed in this definition is the sensitivity of crop yields to limitations in water availability.

This chapter elaborates on the governance of drought adaptation in the North-west Europe region from an agricultural perspective. For this purpose, the elements of the governance systems that are relevant for agricultural production and water use processes are examined and their influence on drought management and adaptation processes are investigated in the subsequent sections of the chapter. In each section, illustrative examples are provided from the six cases of the DROP project that are presented in Chaps. 4–9 of this book. Section 10.2 starts with the general problem

G. Özerol (✉)
CSTM—Department of Governance and Technology for Sustainability, University of Twente, 217, 7500 AE Enschede, The Netherlands
e-mail: g.ozerol@utwente.nl

J. Troeltzsch
Ecologic Institute, 10717 Pfalzburger Strasse 43/44, Berlin, Germany
e-mail: jenny.troeltzsch@ecologic.eu

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perspective by describing the drought and water scarcity problems related to agriculture. Section 10.3 examines the intersectoral linkages by examining the relationship of drought with the risks of the competing sectors of agriculture. Then Sect. 10.4 focuses on the multiplicity of governance levels and outlines the interactions among local, regional, national and European Union (EU) policies and actors. In Sect. 10.5, awareness on the agricultural impacts of drought within the public and policy spheres is assessed. Finally, Sect. 10.6 synthesizes the discussions presented in the previous sections in order to provide an outlook regarding the adaptation to the existing and future impacts of drought from an agricultural perspective.

10.2 Drought and Water Scarcity Problems Related to Agriculture

In many areas of the world, drought negatively affects both rainfed and irrigated agriculture due to decreased water availability and quality. As a result, two common impacts of drought on agriculture are often observed, namely decreased crop yields and harvest qualities. In the North-west Europe region, these impacts result in several implications for the agricultural practices and the farming community, as illustrated in the six case study regions. In the paragraphs below, the general problem perspective in each case study region is described first by providing the role of agricultural production and then by explaining the recent drought occurrences and their implications for the agricultural sector.

More than 46 % of **Flanders**' surface area is used for agriculture and counts for 1.5 % of the gross domestic product of Flanders. The total area of land earmarked for farming has remained roughly the same over the last years. The farmland is mainly situated in the provinces of West and East Flanders, in Hesbaye and Northern Campine. 56 % of the agricultural area is covered with fodder crops (meadows, pasture and feed maize), which can be explained by the importance of stockbreeding (mainly pigs, cattle, poultry). Arable farming uses 35 % of the agricultural area. The main crops are cereals, potatoes and sugar beet. On 8 % of the agricultural area horticulture is practised, mainly for vegetables and fruits. Horticulture is a very relevant economic area for Flanders, e.g. Flanders is the world leader for export of frozen vegetables (Platteau and Van Bogaert 2014). Drought issues are not widely discussed in the Flanders' agricultural sector. However, for horticulture a high water quality is necessary, which partially cannot be reached at some times during the year. Furthermore, the sandy loam area in the centre of Flanders accounts for the high-value horticulture production, but is very dependent on rainfall and groundwater. In the past, Flanders has experienced droughts in the years 1976, 1996, 2003, 2006 and 2011. In recent years, droughts have had several consequences in Flanders and on several occasions water extraction from the Albertkanaal has been restricted. The drought period in the summer of 2003 did not reduce the agricultural yields. This was attributed to the fact that the drought was

not severe enough in the growth season to have had a significant impact (UN 2004). The 1996, 2006 and 2011 droughts were recognized as agricultural disasters, and affected farmers were financially compensated (Chap. 7, UN Department of Economic and Social Affairs Division of Sustainable Development 2004). The expected decrease in summer precipitation—coupled with a possible increase in summer water demand due to higher temperatures, in particular if irrigation becomes a widespread agricultural practice—can lead to a further lack of water availability and problems for the agricultural sector in Flanders (UN Department of Economic and Social Affairs Division of Sustainable Development 2004).

Among the different administrative districts in the **Eifel-Rur** area, the northern downstream area is more characterized by agriculture. The administrative district of Heinsberg, which covers the downstream area of Eifel-Rur is with 65 % the district with the highest percentage of agriculture area in the County Cologne (Bezirksregierung Köln 2013). The southern upstream part of the Rur basin is an area with a low population density, so that for all administrative districts in Eifel-Rur agriculture shows about 1–1.5 % of their gross domestic product. The neighbouring administrative districts have about 0.5 % of their gross domestic product in agriculture which shows that agriculture in Eifel-Rur is relatively important (Landwirtschaftskammer Nordrhein-Westfalen 2012). For the County Cologne, the agriculture area is mainly used for cereals, root crops (e.g. sugar beets), maize and fodder. Stockbreeding covers mainly cattle and poultry. Past drought episodes with consequences for agriculture in the area are very limited. Also the possibility for irrigation is low—with ca. 5 % of the agricultural land. As an example, in 2009, only half of the land which has irrigation infrastructure was actually irrigated (Landwirtschaftskammer Nordrhein-Westfalen 2012). However, in the lower downstream area negative water balance during dry summers is seen as a problem for agriculture, although with a low intensity.

In the **Salland** region, main water use for agricultural purposes is the irrigation of crops and grass. Both groundwater and surface water are used for irrigation. In the 1980s, drainage and groundwater extraction for irrigation and drinking water caused desiccation, which damaged the agricultural areas and the nature areas that were sensitive to the changes in groundwater level. As a result, irrigation with groundwater was banned in the 1990s and 2000s when the water sufficiency was threatened for drinking and industrial uses and for nature areas. However, some agricultural areas have already become dependent on irrigation. This dependency implies that the agricultural areas can dry out without irrigation, which can lead to significant decreases in agricultural production. The vulnerability of these irrigated agriculture practices is expected to worsen also as a result of the increasing pressure for protecting the nature areas that are sensitive to groundwater levels.

The **Vilaine** catchment is a rich agricultural area, where tourism, industry and navigation are also among the major economic sectors that demand water. Main agricultural crops grown include cereals for animal feeding (Bouraoui et al. 2009), and market-oriented gardening, such as cauliflowers, in the eastern part of the catchment. A diversity of agricultural profile can be pointed out all around the catchment. In 1976, 1989 and 2003, severe droughts were experienced in France, which also

influenced the Vilaine region. All of these droughts had significant damages on many sectors, including the agricultural production. As a result, several water- and agriculture-related measures were taken, such as financial protection for farmers and irrigation bans.

Agriculture and food and drink production are major industries in the **Somerset** County. Somerset is a major producer of cider, based on their apple orchards. Furthermore, farming of sheep and cattle and the production of cheese are important in the region. In the whole south-west area of England two-thirds of the land is devoted to agriculture, which employs 3.7 % of the workforce in the region. In 2010–2012, Somerset experienced a drought event with consequences for the whole region, also farmers. Furthermore, expected wetter winters and drier summers are likely to have a profound effect on land management and farming. Building soil organic matter is crucial to drought-proofing soils in Somerset. It is expected that the cultivation of new crops such as grapes, maize, sunflowers and soya will increase in the region, with the consequences of an increased need for irrigation, owing to reduced summer rainfall and higher temperatures. Over the coming century, the region's water resources will come under greater strain as summer droughts potentially grow longer and the demand for irrigation increases.

Main crops grown in the **Twente** region of the water authority Vechtstromen are grass and corn for animal feed and high-value crops, such as flower bulbs and potatoes, all of which are water sensitive. Thus the agricultural sector in Twente is also vulnerable for water scarcity and droughts. Irrigation bans were announced in the 1990s, partly as a result of drainage measures that were taken for the wet periods. Grassland farming is expected to be intensified, and thus need more water for irrigation, which is likely to cause more irrigation bans during dry periods. The recent irrigation policy, which was adopted in 2013 and applies to the areas of all the water authorities in the eastern Netherlands, including the Salland region. The policy aims to balance the use of groundwater and surface water by farmers and the water needs of vulnerable nature areas. However, the policy will only apply to groundwater extractions from new wells, whereas the existing wells are excluded, thus reducing its potential impact .

The agricultural sector in the case study regions can be characterized as being sensitive to water availability, mainly in irrigated areas, and thus negatively affected from the past occurrences of drought. Eifel-Rur region is the only exception to this characterization, where drought has very low impact on agriculture. Furthermore, in all the regions, during drought periods multiple water user sectors are prioritized and the agricultural sector often receives a lower priority than that of domestic, environmental and industrial uses. This lower priority implies restricted or reduced water availabilities for agriculture, and even irrigation bans during severe drought occurrences. The sensitivity to water availability is expected to increase due to varying drivers such as further intensification of farming, increased cultivation of water-demanding crops, decreases in summer precipitations and the need for longer irrigation periods.

10.3 Drought Issues and Competing Sectors' Risks for Agriculture

Balancing the water needs and demands of the agricultural sector with those of the other water user sectors is a challenging task in many countries. Achieving this balance becomes a greater challenge due to the risks associated with drought. As illustrated by the findings from the six case studies, the relative importance of the agriculture sector in the regional economy is a significant factor that influences the resources that are made available to the actors of agricultural production and water use. In all the regions these actors mainly include the farmers, their organizations, and the water authorities.

In **Flanders**, current discussions on drought and water scarcity issues generally include many different perspectives, e.g. from farmers, nature conservation organizations, drinking water companies, etc. However, especially groundwater issues is a well-developed topic in Flanders and the focus in these discussions is mainly on agriculture and economic developments, where as other perspectives such as nature conservation, are less integrated. Various measures were developed for groundwater, but problems still exist with instruments such as source protection (quality), which requires land use changes or change of agricultural practices. Here local authorities are not enforcing and implementing such measures, because they would affect the economic development in the agriculture sector. Advisory services for farmers seem to be quite developed and they work towards water saving. Via the EU Common Agricultural Policy (CAP), investments in more water efficient technologies, such as water reuse, are supported. Furthermore, farmers are taking initiative to build water retention basins on farm level, but the permission process is mostly quite lengthy because farmers need to prove in the application process that the basin will not in reality end up capturing groundwater.

In **Eifel-Rur**, the water board is not responsible for delivering water for agricultural use/irrigation. Therefore, industries and drinking water companies are members of the water board, but not farmers and farmers' associations. Because of this structure, the agricultural water users can not influence the discussions as much as other users. However, this structural problem is offset by the fact that there is a growing culture of exchange and collaboration with smaller stakeholders, such as farmers, which all sides see as a productive relationship that is developing positively over time. Farmers agreed voluntarily to contracts, e.g. addressing nitrogen use, and are therefore cooperating with national conservation organizations, especially the national park authority.

Agriculture is a key economic sector in the **Salland** region, and therefore balancing the water needs of the agriculture with other water uses, particularly the environment, has been and is a crucial objective for many stakeholders, including the water authority, farmers, province and nature conservation organizations. Historically, the risk of flooding has been felt more commonly by the farmers, thus leading to prioritizing the discharge of excess water, rather than water scarcity and drought. However, some measures are taken, such as the irrigation bans during

times of drought to protect the drinking, industrial and environmental uses. Currently, there are no comprehensive measures to address the water scarcity and drought from cross-sectorial perspectives, such as the monitoring or metering of irrigation water use at the field level or the enforcement of the new irrigation policy also for the existing groundwater wells. Nevertheless, there is a growing awareness on the impacts of drought and other climate extremes.

In the **Vilaine** region, the demand from the agricultural sector does not constitute a significant pressure on other uses, except the eastern part of the upstream Vilaine, where irrigation and nature protection are the two competing water uses. Similar to the Salland and Vechtstromen cases, water withdrawals by agro-industries and farmers are not monitored, yet it is planned. Furthermore, the CAP impacts the agricultural water use as well as the consumption of different products, while the measures related to the implementation of the CAP do not address potential interactions with the water policy. However, an agro-environmental measure is funded by the SAGE and implemented by the IAV, through offering contractual measures over five years to farmers who manage wet meadows in the marshes and can receive financial subsidies to maintain the marshes.

In **Somerset**, there are cross-boundary issues that span drinking water supply, environmental flow, and agricultural water use, but planning activities are not coherent. The Environment Agency has a drought plan that covers both water supply and agriculture and irrigation that covers a region rather than a water company. But the water companies have drought plans which cover drinking water supply (in balance with other environmental factors like flow). A more integrated approach could improve the activities. Furthermore, in Somerset it is clear to all actors (it was at least before the flood) that water scarcity and drought is a problem and will probably increase. A difference was in the recognition of the extent of the water scarcity and drought issues and the measures which should be taken up. Problem perceptions were largely defined by sectorial interests, particularly agriculture and nature on the Levels and Moors. For the Levels and Moors there are no real mechanisms to persuade landowners to keep their stock out of the grass and to keep the water levels up for delivery of other ecosystems services other than agriculture and no reason not to intensify agricultural production in those fields. Higher tier agriculture Sites of Special Scientific Interest (SSSIs) focused on exclusivity but not interconnectivity, for example they are not linked-up special sites. Although there are designated SSSI areas there is seen to be not enough guidance for farmers outside these specially designated areas, and little opportunity to “enforce”. The range of measures are largely positive, however, in the context of decreased regulation and public spending the extent to which these are monitored and enforced going forward is uncertain. Furthermore, the subsidy regime was not developed with the aim that farmers should directly manage water and a system of monitoring or enforcement related to this was not established. For example, issues such as soil compaction were seen as voluntary actions as opposed to embedded in subsidized actions. A fuller range of agricultural measures could still be implemented, e.g. agricultural mitigation measures and the adoption of clearer monitoring and enforcement.

In the **Twente** part of Vechtstromen, irrigation bans are applied during dry periods, yet little pressure is felt in the agricultural sector to incorporate comprehensive water scarcity and drought measures, such as metering groundwater and surface water extractions. On the contrary, the intensive agriculture practices, which imply, among others, increased use of machinery and irrigation water, have a negative impact on surface runoff and groundwater levels, respectively. There are several agri-environmental measures, which are mostly voluntary and fragmented, and thus can address water scarcity and drought limitedly. The political and public awareness is seen as too low to create incentives that combine drought resilience and agricultural objectives. Two types of intersectoral competition affect the drought resilience of the agricultural sector both in Salland and Twente. First one is on the difference regarding surface water use priorities in the east and west of the country. In the west part of the Netherlands, surface water needs to be flushed to prevent salt intrusion, which implies a lower availability for agricultural use in the east part. Second one is the displacement chain, which outlines the priorities of competing water uses during dry periods, when meeting the water demand for all uses becomes impracticable. As explained in Chap. 8, agricultural production has a low priority in this chain. Although both of these competitions exist for a long time, they can become threatening for the agricultural sector, under worsening water scarcity and drought conditions.

Looking at the intersectoral linkages related to drought and its agricultural impacts, a diversity of situations can be discerned from the six case study regions. On the one hand, in the Flanders and Somerset cases, several measures are in place to address the cross-sectorial issues and to encourage measures, such as water saving and reuse, with varying enforcement levels among the regions. On the other hand, in the Vilaine, Salland and Twente cases, the competition among the sectors are addressed, while the current high water availability levels do not create enough incentives to monitor water withdrawals in the agricultural sector. Finally, in the Eifel-Rur region, the relatively low importance of the agricultural water use leads to a lack of recognition regarding the intersectoral linkages, with a growing interest from the side of farmers.

10.4 Multilevel Interactions Regarding Agricultural Measures

Multiple governance levels can be relevant regarding the agricultural practices and the political and practical measures related to drought adaptation and management. Within the North-west European context, there is an inherent role of the EU-level policies on water and agriculture, whereas the local and national actors and policies also interact regarding the formulation and implementation of agricultural practices and measures.

For **Flanders**, all matters related to agriculture come within the scope of the regional authorities, apart from food safety, which is still a federal Belgium policy area. In the form it takes in Flanders agricultural policy which is essentially European based. At this level Flanders is able to shape its policy in the light of what is decided by the EU authorities. Drought is seen as a problem by some farmers but the uptake of the problem by different political level starts slowly. The regional Flemish environment agency (VMM) starts to implement some initiatives and measures, but provinces and municipalities have still a limited awareness of the potential problem. Beside this, provinces and municipalities include the possible consequences on agriculture and other economic activities in their decision-making. In general, both levels work closely together.

The two main actors that play an important role in the water management regime at the **Eifel-Rur** area are the water board (WVER) and the district government. The water users with a water right of a certain size are automatically members of the water board in the area. However, smaller actors such as farmers do not have the same voice because they are not water board members. During the implementation of the Water Framework Directive (WFD), a large stakeholder process was organized by the region's water board. Therefore, the actors that are not involved as water board's members are also integrated in the discussions and seem to be quite satisfied with the participatory process. Since, agriculture is a relevant economic activity in the downstream areas of the Rur basin, the farmers as a stakeholder group are in a position to impose their own agenda to a great extent. There seems to be a reluctance to collaborate with water management objectives (e.g. when measures do not coincide with agriculture aims). For instance, municipalities with strong farming presence would resist repurposing some areas of land for WFD Programmes of Measures, although the legal basis is clearly against them. Also for drought-related measures this kind of deadlocks can appear.

In the Netherlands, thus for the **Salland** and the **Twente** regions, a broad range of governance levels are relevant, whereas the regional level is the most prominent one due to the role of water authorities at this level. Through designing an irrigation policy, the five water authorities were successful in developing a common regulation at the regional level. Other regional actors were also invited by the water authorities. However, the LTO and NMO, the respective representatives of individual farmers and local nature conservation organizations, were not able to effectively participate. The development process of the irrigation policy constitutes a typical example of upscaling where the irrigation issue was scaled up from the local level to the regional level. Additionally, the EU level creates pressure on the water boards to work together. According to the WFD, all these water boards are in the Rhine-East and they need to collaborate on water planning and management, of which irrigation management constitutes a significant component. The fact that the water boards have a history of maintaining good relations creates additional impetus regarding the enforcement of the irrigation policy.

Two national measures in the Netherlands also have regional and local implications for agriculture. A national agreement foresees that water from the rivers can

be transferred from other regions. However, the water boards differ in terms of the practicality and costs of transferring water from other regions. For instance, WGS, the regional water authority of Salland, has abundant water that could be transferred to its region, whereas it is more difficult for Vechtstromen to bring water from other regions. The positions regarding the responsibility of water authorities in providing water to farmers differs between the water boards that have sloping areas and those have mostly flat areas. The displacement chain is also implemented at the national level to balance the water supply and demand in cases of extreme water shortages by transferring water from abundant areas and sectors to scarce areas and sectors. The decisions are taken by a national committee that involves representatives from all provinces and the functioning of the whole system is controlled by the Rijkswaterstaat, the Dutch national water authority.

In the **Vilaine** catchment, there is little evidence on the interaction of national and subnational levels regarding agricultural measures on drought resilience. However, the implementation of CAP influences the agricultural production and water consumptions at the farm level. As explained in Sect. 10.3, measures that result from the CAP are fragmented from the other water- and agriculture-related measures, since there is no regional agricultural water planning and management. Regional water management plans however address drought and water scarcity through enforcing limitations and bans on irrigation, especially during the summer and in the sensitive areas.

The different actors and levels in the **Somerset** region build up a strong relationship and culture of cooperation. But the vulnerability of such relationships can be seen after the flood events in 2013/2014. Discussions about the nature of the floods and possible solutions eroded the confidence between the different stakeholders and actors pulled out of the circle. On the community level, especially relevant for the implementation of agri-environmental measures, the Farming and Wildlife Advisory Group was seen. They are seen as an in-between agent between environmental groups and farmers. But they are dependent on project funding and therefore exists the risk of reduced activities in case of a reduction of funding. Positive interlinkages between farmers and Internal Drainage Boards (IDB) exist. IDBs are risk management authorities responsible for maintaining rivers, drainage channels, pumping stations, etc. IDB was noticed as a group that is very responsive to farmers' needs. A good relationship was also built up between the local National Farmers Union (NFU) and the farming community. Room for improvement is seen for the relationship between farmers and statutory bodies. Their relationship is not characterized by an open discussion culture but rather by punishment.

A diversity of governance levels and their interactions is observed in the North-west Europe region. In Flanders and Somerset, subnational stakeholders such as farmer organizations and regional water authorities closely collaborate. In other cases, the relevant EU policies explicitly drive cross-level interactions, while there is little evidence that these directly influence the adaptation of the agricultural sector to drought and water scarcity conditions. In the Eifel-Rur, Salland and Twente cases, the WFD requirements create multilevel interactions, such as the

collaboration among the regional water authorities that are in the same river basin as well as the participation of local stakeholders in water planning and management decisions, whereas in the Vilaine case, the CAP influences water consumptions at the farm level, although the CAP measures are fragmented from the other water- and agriculture-related measures.

10.5 Public and Political Awareness on Agricultural Effects of Drought

Since drought is an emerging policy issue in most of the North-west European countries, the awareness within the public and political spheres is of crucial importance regarding both the effective implementation of existing measures as well as the formulation of additional measures in the near future.

On the whole, in **Flanders** drought is not yet an issue compared to the perception of flooding impacts for the region. The awareness for water scarcity and drought problems is very low for some stakeholders. Awareness of problems among farmers is growing, but they still want to use groundwater resources today and do not integrate the perception of future generations in their actions. Instruments for awareness raising of different stakeholders are not clearly defined, either. The problem is mainly framed as an agricultural issue, so that the focus of the existing discussion on droughts is more on agriculture and economic development, e.g. compared to consequences on nature areas. The aim of the VMM DROP pilot case was the development and use of indicators for the monitoring and reporting of the drought situation and the modelling of drought impacts using this measurement network. The activities also focused on relevant indicators for the agricultural sector. Furthermore, a coordination platform for drought was initiated that brings together different governmental agencies and organizations involved in water management and agriculture, such as the Flemish agricultural department, regional and national water managers, the provinces and municipalities.

Awareness on drought issues is low in **Eifel-Rur**. Concrete drought-related measures are not taken up for agriculture. It seems a hard task to convince actors of the benefits of working on drought preparedness, as drought events in the region occur very far in between. But farmers start to notice the problem of negative water balance during dry summers. Especially, because the farmers shift to specialized crops requiring occasional irrigation which further influences the water demand. Addressing droughts could be done—at least partially—within other, broader initiatives. For instance, the topic of water scarcity (structural) rather than drought (short term and very far in between) could prove a better banner under which to propose actions that increase system resilience. Climate change can play a role in these debates, as it is predicted that climate change will increase resource use conflicts.

In the **Salland** region, many actors adopt a supply-oriented approach to water. Thus, the major goal is providing the right amount of water with the right quality for all water users. For the water authorities, these users mainly include the agricultural users. The focus on supply has been shifted, since other interests became important in the past few decades as it was realized that the amount of freshwater is limited and climate change is exacerbating this issue. For the agricultural sector, flood protection is still the major goal, whereas drought is seen as a relatively new issue. Although the dry sandy soils of the eastern Netherlands are prone to drought, it is difficult to create a broad awareness of the general public, and especially the farmers, who are concerned more about wet fields and high groundwater levels than the dry fields. There is also a knowledge gap on the appropriate groundwater levels for both agriculture and nature and how they affect one another at various scales.

In the case of **Vilaine**, drought and water scarcity are not seen as urgent issues for the agricultural sector. This can be mainly attributed to the historically favourable situation in the region and the crisis management approach. Thus, the awareness and understanding of both the water users and water managers on the potential impacts of climate change remains weak. The connection between surface water and groundwater resources are not well known, which is partly due to the fact that water withdrawals are not monitored.

In **Somerset**, there is a coherent agreement between the different actors that droughts are already problematic for the region and that these problems will increase in the future. It seems that farmers are quite aware of the problem, but the level of recognition is seen as lower for agriculture and higher for other sectors such as nature. Not the full range of possible mitigation measures on farms are taken up, e.g. rainwater tanks are only installed if there is a subsidy available and is motivated more by saving money. Furthermore, the perspectives on drought are driven by sectoral views, e.g. by agriculture and nature. With further programmes the problem definition could become more coherent. But already before and especially after the flooding in 2013/2014 droughts are seen as a secondary problem to flooding in the region. Opportunities for co-benefits between flood protection and drought protection via the launched action programmes are possible but are not central in the design of activities regarding flood protection. In political discussions there is a reluctance to point out co-benefits between drought and flood measures.

Drought and water scarcity is also a low profile issue in the **Twente** region of Vechtstromen, limiting the financial and political support that could be given for preventive measures. This is mainly due to the historically developed artificial system for managing water levels, which is seen in the west of the country as a sufficient drought management measure, and the conflicting priority for preventing saltwater intrusion by flushing this artificial system. Thus, the eastern part of the country that has areas with high and sandy soils, which depend on rainwater and groundwater, does not receive political priority in terms of drought and water scarcity. The new Delta Programme, which recognizes the climate change and its impacts, is expected to contribute to an improved political awareness for drought in all areas of the country.

Since drought is not yet perceived as an urgent issue in the six case study regions, the overall awareness regarding the agricultural impacts of drought is assessed to be low, especially in the Eifel-Rur, Vilaine, Salland and Twente cases. This situation is also closely related to the historical context, which involves water problems that result from too much water, i.e. floods, rather than drought and water scarcity. Nevertheless, there is an increasing trend in terms of the awareness of the actors that are in the mostly affected areas. These actors mainly include the individual farmers and farmers' organizations, as observed in the cases of Flanders and Somerset.

10.6 Conclusions

This chapter presented a diagnosis on the current state of the governance of drought adaptation in North-west Europe from a cross-cutting perspective on agriculture. The findings indicate both several common regional level implications, as well as issue-specific observations for the local contexts.

Despite being a key user of freshwater resources and often sensitive to water availability during drought periods, the agricultural sector receives a lower priority compared to other water user sectors, which mainly include energy production and drinking water. Pressures to monitor water withdrawals and enforce water withdrawal limitations in agriculture can be expected to intensify with increasing demands not only from the agricultural sector, but also by cross-sectoral impacts of other water user sectors. This competitive disadvantage can lead to water efficiency improvements in the sector through, for instance the dissemination of water saving and water reuse technologies. Additionally, the demand for crop insurances could increase as well as the need for further insurance products such as cooperative private–public insurance products.

Since agricultural production constitutes an economic sector in many areas of North-west Europe, multiple governance levels, ranging from the local to the EU level, interact regarding the associated water problems, including water scarcity and drought. However, there is a clustering of the local and subnational levels, which predominantly shape the implementation of water- and agriculture-related measures, and the EU-level measures that result from the corresponding water and agricultural policies, i.e. the WFD and the CAP.

Although agriculture is a very vulnerable sector regarding the impacts of drought, the essential public and political awareness on drought is limited. The historical context of the North-west Europe region, which is dominated by events of too much water rather than water scarcity and drought, plays a significant role in the relatively low awareness regarding the current and future impacts of drought. In the areas that are already affected by drought, especially the regional authorities, such as environmental agencies and water authorities, and the farmers and their organizations carry the greatest potential in terms of improving drought awareness in both public and political spheres.

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